4-19-05

AF/2832

UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	10/056,227
Filing Date:	January 23, 2002
Inventor:	Francis M. Creighton, IV
Title:	Rotating and Pivoting Magnet for Magnetic Navigation
Docket No.:	5236-000300

APPLICANT'S BRIEF ON APPEAL

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APPLICANT'S BRIEF ON APPEAL

Statement of the Real Party in Interest (37 C.F.R. 41.37(c)(1)(i)

The real party in interest is Stereotaxis, Inc., a publicly traded corporation, by virtue of an assignment dated March 17, 2002, recorded at Reel 012927, Frame 0001, on May 28, 2002.

Statement of Related Appeals and Interferences (37 C.F.R. 41.37(c)(1)(ii))

There are no related appeals or interferences.

Status of the Claims (37 C.F.R. 41.37(c)(1)(iii))

Claims 1-7 and 11-15 are pending in this application. All claims were rejected in the Final Office Action of September 17, 2004. Applicant appeals the rejection of all claims.

Status of the Amendments (37 C.F.R. 41.37(c)(1)(iv))

No amendments were filed after the Final Office Action of September 17, 2005.

Summary of the Claimed Subject Matter (37 C.F.R. 41.37(c)(1)(v))

This invention relates to a magnet assembly that includes a magnet that is comprised of a plurality of segments. This magnet is particularly useful for the magnetic navigation of medical devices inside the body (although the invention is not in any way limited to such uses). Magnets in accordance with the present invention can be positioned on opposite sides of a subject, and because of their small size and unique magnetic field properties, can be easily rotated and pivoted to create a magnetic field in any direction to orient a medical device in the subject. In contrast, a conventional block of magnetic material which is magnetized in one direction would be much heavier (and thus more difficult to pivot and rotate) and would require more pivoting and rotating to be able to change the magnetic field direction applied by the magnet.

Claim 1 is directed to a magnet comprised of segments. Each of the segments has a different magnetization direction that is selected to (1) optimize the magnetic field generated by the magnet in a selected direction at an operating point in front of the assembly and (2) so that the pivoting of the magnet about an axis behind the magnet through an arc of less than 90° causes the magnetic field direction at the operating point to vary by 180°. This claimed construction allows the use of a physically smaller and lighter magnet than a conventional magnetic block generating a magnetic field of similar strength. This allows smaller and less expensive assembly to be used to move the magnet. Furthermore in most cases the clamed magnet requires less rotating and pivoting to achieve the same change in magnetic field direction.

Claim 2 is directed to a magnet assembly comprising a magnet mounted for pivoting about a first axis spaced from the magnet, and rotating about a second axis that is perpendicular to and intersects with the first axis. This magnet comprises a plurality of segments. Each segment has a magnetization direction so that the pivoting of the magnet about the first axis through an arc of less than 90° causes the magnetic field direction created by the magnet at an operating point spaced from the magnet to vary by 180°.

Claim 3 is directed to a magnet assembly comprising a magnet mounted for pivoting about a first axis spaced from the magnet, and rotating about a second axis that is perpendicular to and intersects with the first axis. The magnet comprises a plurality of

segments each with a magnetization direction such that through a combination of pivoting and rotating the magnet projects a magnetic field in any direction at an operating point spaced from the front of the assembly. Claims 4 - 5 requires that the operating point is at least 12 inches from the magnet assembly. Claim 5 requires that the assembly can project a magnetic field at the operating point of at least 0.04T in any direction. Claim 7 requires that the assembly can project a magnetic field at the operating point of at least 0.1 T in any direction. Claim 11 requires that the segments of the magnet are magnetized in directions such that the pivoting of the magnet about the first axis through an arc of less than 90° causes the magnetic field direction created by the magnet at the operating point to vary by 180°.

Claim 7 is directed to a combination of two magnet assemblies disposed on opposite sides of a patient. Each of these magnet assemblies comprises a magnet mounted for pivoting about a first axis spaced from the magnet, and rotating about a second axis that is perpendicular to and intersects with the first axis. Each of the magnets comprises a plurality of segments each segment having a magnetization direction such that through a combination of pivoting and rotating the magnet projects a magnetic field in any direction at an operating point spaced from the front of the assembly. Claim 12 requires that the segments of each magnet are magnetized in directions such that the pivoting of the magnet about the first axis through an arc of less than 90° causes the magnetic field direction created by the magnet at the operating point to vary by 180°. Claim 13 requires that the operating point (where the magnet applies the magnetic field is at least 12 inches from the magnet assembly. Claim 14 requires that each of the assemblies can project a magnetic field at the operating point of at least 0.04 T in any direction. Claim 15 requires that the assemblies together project a magnetic field at the operating point of at least 0.1 T in any direction.

Fig. 17 shows the magnets as part of magnet assemblies on opposite sides of a patient support to generate a strong magnetic field in any direction in a patient. It would be difficult (if not impossible) to mount conventional block magnets adjacent a patient to achieve the same range of directions at the same strength.

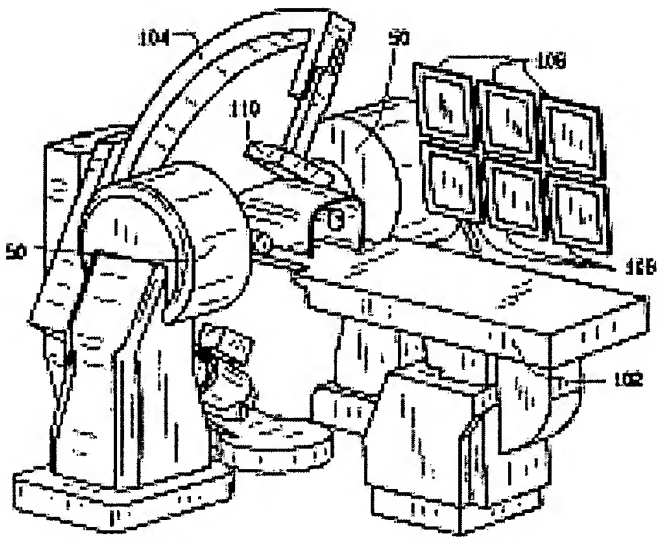

FIG. 17

Fig. 6 shows a preferred embodiment of a segmented magnet with a frame representing the housing. Each "stripe" of the magnet represents a different segment with a specially selected magnetization direction in contrast to a conventional magnet which is a monolithic block magnetized in just one direction.

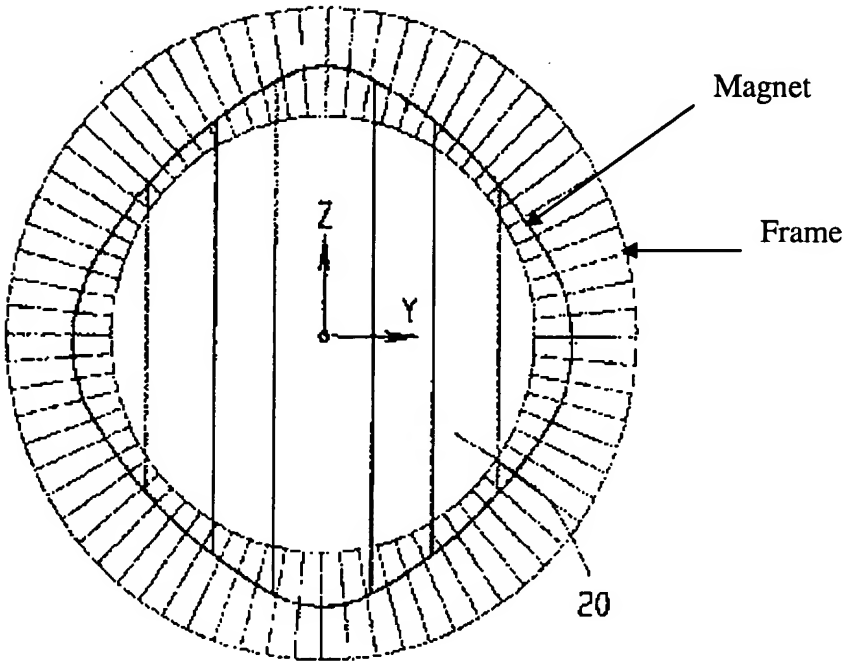

FIG. 6

Grounds of Rejection to be Reviewed in Appeal (37 C.F.R. 41.37(c)(1)(vi))

The grounds of rejection in the Final Office Action of September 17, 2004:

Claims 1-7 and 11-15 are rejected under 35 U.S.C. 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-7 and 11-15 are rejected under 35 U.S.C. 103 as being unpatentable over Ritter et al., U.S. Patent No. 6,241,671 in view of Katznelson et al., U.S. Patent No. 6,157,281.

Argument (37 C.F.R. 41.37(c)(1)(v))

Claims 1-7 and 11-15 are not indefinite under 35 U.S.C. 112, second paragraph for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Office Action states that "applicant should clarify the structure intended to have the plurality of segments". Claim 1 states: "A magnet assembly comprising a magnet composed of a plurality of segments . . .". Applicant submits that this language is clear. The claim is directed to a magnet assembly; the magnet assembly comprises a magnet; this magnet is composed of a plurality of segments. The language clearly and unambiguously states that the magnet is comprised of a plurality of segments.

With respect to the magnetization direction, the magnetization directions of the segments are such that pivoting of the magnet through some arc less than 90° causes the magnetic field at the operating point to change direction 180°. The Office Action states that this implies that 1° pivoting would cause a 180° shift of the magnetic field. While this may be what the Office Action infers, it is not what the applicant is implying. Applicant is simply stating that some relatively small pivoting of the magnet causes a larger change in the magnetic field direction at the operating point. The Office Action also criticizes the claim for not specifying "what the actual shift is relative to." Applicants submit that it is clear to a person of ordinary skill in the art that shift in the magnetic field direction is relative to the magnetic field direction before the magnet is rotated.

Claims 1-7 and 11-15 Would Not Have Been Obvious under 35 U.S.C. 103 from Ritter et al., U.S. Patent No. 6,241,671 in view of Katznelson et al., U.S. Patent No. 6,157,281

Claims 1 – 7 would not have been obvious under 35 U.S.C. §103 over Ritter el al., U.S. Patent No. 6,241,671, in view of Katznelson et al. et al., U.S. Patent No. 6,157,281.

Claim 1

The rejection of claim 1 should be reversed because neither Ritter et al. nor Katznelson et al. disclose "a magnet assembly comprising a magnet composed of a plurality of segments, each segment having a magnetization direction that optimizes the magnetic field in a selected direction at an operating point in front of the assembly and so that the pivoting of the magnet about an axis behind the magnet through an arc of less than 90° causes the magnetic field direction at the operating point to vary by 180°" as set forth in Claim 1. Specifically, Ritter et al. does not even disclose a magnet comprised of a plurality of segments, let alone segments magnetized as required by claim 1. While Katznelson et al. discloses a magnet comprising a plurality of segments, Katznelson et al. does not disclose segments magnetized as required by claim 1, magnetization directions that cause the magnetic field projected by the magnet at an operating point to change direction by 180 degrees when the magnet is pivoted arc of less than 90 degrees. Katznelson et al. does not even suggest that this can be done, let alone how to do it. This is not surprising because the function of MRI magnet is to apply a substantially uniform magnetic field in the image volume in a subject, not provide a readily changeable field to orient magnetically responsive devices. Katznelson et al. teaches "In an MRI and/or MRT system a strong *uniform* magnetic field is required in order to align an object's nuclear spins". Col. 1, lines 32-33 (emphasis added). Katznelson et al. would specifically avoid applicant's arrangement because the resulting field is purposefully non-uniform.

Claim 2

The rejection of claim 2 should be reversed for the same reasons discussed above with respect to claim 1. Ritter et al. does not disclose a magnet comprising segments, and while Katznelson et al. discloses a segmented magnet, it does not show or suggest that the magnetization directions of the sections "so that the pivoting of the magnet about the first axis through an arc of less than 90° causes the magnetic field direction created by the

magnet at an operating point spaced from the magnet to vary by 180°" as required by claim 2. The uniform fields desired for MRI applications would teach away from a magnet that produces such a varying field. As stated above with respect to claim 1, Katznelson et al. teaches that "[i]n an MRI and/or MRT system a strong *uniform* magnetic field is required in order to align an object's nuclear spins" Col. 1, lines 32-33 (emphasis added). It would not be obvious to modify the Katznelson et al. magnet contrary to its intended use.

Claims 3 – 6, and 11

The rejection of claims 3 – 6 and 11 should be reversed because the Office Action fails to establish that Ritter et al., Katznelson et al., or any obvious combination of them would result in a magnet assembly with multi-segmented magnet that "through a combination of pivoting and rotating the magnet projects a magnetic field in any direction at an operating point spaced from the front of the assembly." The Ritter et al. device is capable of different applying magnetic fields in different directions, but this is achieved by changing the currents in a set of electromagnets, not by pivoting and rotating the electromagnets. The Katznelson et al. device produces a uniform field, there is no teaching or suggestion of moving the magnetic to change the field, or of what would happen if the magnet were pivoted and rotated. Ritter et al. and Katznelson do not teach a magnet that can project a field in any direction at an operating point, and lacking this claimed element, the combination cannot make applicant's claimed invention obvious.

The rejection of claim 4 should be reversed because claim 4 depends from claim 3, shown above to be allowable, and because there is no teaching or suggestion of a magnetic assembly in which the magnetic field at the claimed operating point can be oriented in any direction simply by pivoting and rotating a magnet.

The rejection of claims 5 and 6 should be reversed because claims 5 and 6 depend from claim 3 shown above to be allowable, and because there is no teaching or suggestion of a segmented magnet that can provide a magnetic field of the specified strength (0.04 T in claim 5; 0.1 T in claim 6) in any direction simply by pivoting and rotating the magnet.

The rejection of claim 11 should be reversed because claim 11 depends from claim 3, shown above to be allowable, and because neither Ritter et al. nor Katznelson

teach a segmented magnet whose segments are magnetized so that "the pivoting of the magnet about the first axis through an arc of less than 90° causes the magnetic field direction created by the magnet at the operating point to vary by 180°". Ritter et al. relates primarily to electromagnets, not segmented magnets. Katznelson et al., relates to magnets for MRI where uniformity of the field is critical and thus it would not just be unobvious, but contrary to the purpose of Katznelson et al. to make a magnet in which the field varies so as required by the claim. As stated above with respect to claim 1, Katznelson et al. teaches that "[i]n an MRI and/or MRT system a strong *uniform* magnetic field is required in order to align an object's nuclear spins" Col. 1, lines 32-33 (emphasis added). Katznelson et al. teaches away from the claimed magnet.

Claims 7 and 12-15

The rejection of claim 7 should be reversed because neither Ritter et al. nor Katznelson et al. teach the use of a pair of magnet assemblies that pivot and rotate to apply a magnetic field in any direction. Ritter et al, teaches a single magnet assembly that partially surrounds a portion of the body. Katznelson, although it shows opposed of magnets, does not teach or suggest that the magnets can be pivoted and rotated to project "a magnetic field in any direction at an operating point spaced from the front of the assembly." The references do not teach opposed magnet assemblies that can project a magnetic field at an operating point between them in any direction.

The rejection of claim 12 should be reversed because claim 12 depends from claim 7, shown above to be allowable, and because neither Ritter et al. nor Katznelson teach a segmented magnet whose segments are magnetized so that "the pivoting of the magnet about the first axis through an arc of less than 90° causes the magnetic field direction created by the magnet at the operating point to vary by 180°". Ritter et al. relates primarily to electromagnets, not segmented magnets. Katznelson et al., relates to magnets for MRI where uniformity of the field is critical and thus it would not just be unobvious, but contrary to the purpose of Katznelson et al. to make a magnet in which the field varies so as required by the claim. As stated above with respect to claim 1, Katznelson et al. teaches that "[i]n an MRI and/or MRT system a strong *uniform* magnetic field is required in order to align an object's nuclear spins" Col. 1, lines 32-33 (emphasis added). Katznelson et al. teaches away from the claimed magnet.

The rejection of claim 13 should be reversed because claim 13 depends from claim 7, shown above to be allowable, and because there is no teach of suggestion of a magnetic assembly in which the magnetic field at the claimed operating point can be oriented in any direction simply by pivoting and rotating a magnet.

The rejection of claims 14 and 15 should be reversed because claims 14 and 15 depend from claim 7 shown above to be allowable, and because there is no teaching or suggestion of a segmented magnet that can provide a magnetic field of the specified strength (0.04 T in claim 14; 0.1 T in claim 15) in any direction simply by pivoting and rotating the magnet.

Summary

The claimed magnet assemblies comprising specially magnetized segmented magnets are not obvious from Ritter et al., which relates primarily to electromagnets, or from Katznelson et al., which although it discloses a segmented magnet, relates to magnets for creating a uniform field, not a magnet that can project a magnetic field that changes at least 180° up pivoting less than 90° (claims 1 and 2) or which can project a magnetic field in any direction simply by rotation of an pivoting of the magnet (claims 3-7 and 11-15).

For all of the reasons stated above, the rejection of claims 1-7 and 11-15 as indefinite under 35 U.S.C. 112, second paragraph, and the rejection Claims 1-7 and 11-15 under 35 U.S.C. 103 from Ritter et al., U.S. Patent No. 6,241,671 in view of Katznelson et al., U.S. Patent No. 6,157,281 should be reversed.

Respectfully submitted,

Bryan K. Wheelock

APPENDIX

1. A magnet assembly comprising a magnet composed of a plurality of segments, each segment having a magnetization direction that optimizes the magnetic field in a selected direction at an operating point in front of the assembly and so that the pivoting of the magnet about an axis behind the magnet through an arc of less than 90° causes the magnetic field direction at the operating point to vary by 180°.

2. A magnet assembly comprising a magnet mounted for pivoting about a first axis spaced from the magnet, and rotating about a second axis that is perpendicular to and intersects with the first axis, the magnet comprising a plurality of segments, each segment having a magnetization direction so that the pivoting of the magnet about the first axis through an arc of less than 90° causes the magnetic field direction created by the magnet at an operating point spaced from the magnet to vary by 180°.

3. A magnet assembly comprising a magnet mounted for pivoting about a first axis spaced from the magnet, and rotating about a second axis that is perpendicular to and intersects with the first axis, the magnet comprising a plurality of segments each with a magnetization direction such that through a combination of pivoting and rotating the magnet projects a magnetic field in any direction at an operating point spaced from the front of the assembly.

4. The magnet assembly according to claim 3 wherein the operating point is at least 12 inches from the magnet assembly.

5. The magnet assembly according to claim 3 wherein the assembly can project a magnetic field at the operating point of at least 0.04T in any direction.

6. The magnet assembly according to claim 3 wherein the assembly can project a magnetic field at the operating point of at least 0.1 T in any direction.

7. In combination, first and second magnet assemblies disposed on opposite sides of a patient, each magnet assembly comprising a magnet mounted for pivoting about a first axis spaced from the magnet, and rotating about a second axis that is perpendicular to and intersects with the first axis, the magnet comprising a plurality of segments each with a magnetization direction such that through a combination of pivoting and rotating the magnet projects a magnetic field in any direction at an operating point spaced from the front of the assembly.

8. (cancelled)

9. (cancelled)

10. (cancelled)

11. The magnet assembly according to claim 3 wherein the segments of the magnet are magnetized in directions such that the pivoting of the magnet about the first axis through an arc of less than 90° causes the magnetic field direction created by the magnet at the operating point to vary by 180°.

12. The combination according to claim 7 wherein the segments of each magnet are magnetized in directions such that the pivoting of the magnet about the first through an arc of less than 90° causes the magnetic field direction created by the magnet at the operating point to vary by 180°.

13. The combination according to claim 7 wherein the operating point is at least 12 inches from the magnet assembly.

14. The combination according to claim 7 wherein each assembly can project a magnetic field at the operating point of at least 0.04T in any direction.

15. The combination according to claim 7 wherein the assemblies together can project a magnetic field at the operating point of at least 0.1 T in any direction.